this section will probably never achieve the accuracy attained in other sections, yet any failure is usually on the side of safety, and ample warning of frosts can be given. During the 1929 season no damaging frosts occurred without issuance of warnings to the growers sufficient to enable them to make needful preparations for the night. This in itself should be considered a demonstration of the utility and feasibility of a frost-warning service, and it is not too much to say that the growers have profited from the service in the past to the extent that it may be considered indispensable in the future from their point of view.

WEATHER FORECASTS IN RELATION TO THE MARKETING OF CITRUS FRUITS

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Nearly all agricultural crops are subject to hazards of weather throughout their growing period, but the successful growing and marketing of citrus fruits depends to a large degree on the behavior of the weather throughout the entire year. Severe winter frosts sometimes destroy the greater part of the crop on the trees, and millions of dollars have been spent for frost protective devices. If unduly high day temperatures or low night temperatures occur within a day or two following the fumigation of orange trees for insect pests, much of the fruit is likely to fall to the ground, and the foliage often shows considerable injury. Unseasonably high temperatures in June, soon after the end of the blossoming period, often cause a heavy drop of small green fruits. Hot, dry, desert winds in some districts in California damage fruit and foliage nearly every year. Long continued periods of rain or dense fog sometimes stop orange-picking operations for days, or even weeks, and cause a heavy decay of fruits on the trees.

The Weather Bureau has been aiding the growers and packers of citrus fruits to ameliorate these difficulties as much as possible through forecasts of periods of adverse weather. Only recently, however, has much attention been paid to issuing forecasts to aid in meeting marketing problems caused by weather conditions.

It has long been recognized that lemon sales depend to a very great extent on summer temperatures in the districts where fruit is sold, and in recent years, since the consumption of orange juice has increased so materially, the sale of oranges has been similarly affected. There is a steady demand for lemons throughout the year for culinary and general purposes, but the use of lemons for beverage purposes takes place largely during the hot summer months. More than 50 per cent of the total yearly lemon sales are made during the period from May to August, inclusive.

Speculators buy and store lemons in the eastern marketing centers during the late spring to care for normal consumption during the early summer, but unusually high temperatures or long continued hot weather soon exhausts the supply, resulting in a shortage of fruit and abnormally high prices. There is practically always an adequate supply of lemons in storage at the packing houses in California, but it requires about 10 days for a car of fruit to reach the eastern markets, and individual periods of hot weather usually do not last more than a week. Forecasts of higher than normal summer temperatures in eastern markets made two or three days in advance permit the shipment of additional supplies of fruit from California to reach the markets before an acute shortage of lemons has developed, make possible the sale of a larger quantity of fruit, and maintain a more reasonable price to the consumer.

California had an unusually large crop of lemons to market during the summer of 1928. During the early part of June continued cool weather made it very difficult to move the crop in satisfactory volume and obtain fair prices. On June 27 the San Francisco forecaster advised the marketing agency in Los Angeles that temperatures above the seasonal normal were to be expected east of Mississippi River within a few days. On that date about 700 cars of lemons were on track in the East or en route. The market was declining, and it had been decided to reduce shipments from California until the market showed signs of improvement. On receipt of the forecast, shipments were continued without reduction. The effect of the hot wave was reflected almost immediately in the lemon market. On July 5, 184 cars of lemons were sold by the California Fruit Growers' Exchange, constituting the largest sales on any one day in the history of that organization. The price per box f. o. b. California averaged for all these cars $4.73, the highest car-lot price since 1921, with the exception of 1923, when the price average was on only 28 carloads. The net return on these 184 cars of fruit was $315,000. If shipments had been curtailed, as had been planned before the receipt of the forecast, less fruit would have been available for sale and the price to the consumer would have been much higher.

During the winter months cold waves or unusually heavy falls of snow in the eastern markets not only interfere with the movement of citrus fruits from California by rail, but also materially reduce the consumption of fruit. During periods of unusually cold weather in the winter of 1928–29 considerable fruit was frozen in the cars en route to market, and some important markets were closed entirely, due to heavy snow. No citrus fruit was unloaded in Chicago over a period of several days during one of the severest cold spells.

Forecasts of these cold waves in eastern territory enable the marketing agencies to hold entire trainloads of fruit in the warmer southern territory and at railroad division points, where the cars are kept in heated sheds until temperatures have moderated. The picking and packing of fruit in California is discontinued until the market has had time to recover from the demoralization caused by the low temperatures and heavy snow.

The writer believes that special forecasts of the type that have been described will prove to be of increasing value to many industries in the adjustment of marketing problems caused by weather conditions. This is a field for service of great practical value, and a field which is capable of much greater development, now that facilities for making more accurate forecasts for periods of several days are becoming available.